DELAWARE MATERIAL SPECIFICATION

CONCRETE MS 201

1. **SCOPE**

This specification covers the quality of concrete.

2. **QUALITY**

Concrete shall be composed of Portland Cement, fine and coarse aggregate and water. An air-entraining admixture may be used.

a. Portland Cement shall conform to the requirements of Delaware Material Specification 202.

b. Fine and coarse aggregates shall conform to the requirements of Delaware Material Specification 203. The aggregates shall be handled in a manner to prevent contamination and segregation.

c. Water shall be clean and free from harmful chemicals (suitable for drinking).

d. Air-entraining admixtures shall conform to the requirements of ASTM Specification C-260, Air-Entraining Admixtures for Concrete.

e. Class F fly ash meeting ASTM C-618 may be used in the concrete mix to replace not more than 20% of the cement by weight. Test data on pozzolanic materials shall be performed by an independent testing laboratory with test results included with the submittal of design mixes to be approved before use.

f. Water-reducing and set-retarding admixtures may be used upon satisfactory submission of test results using a trail mix design and manufacturer's certification of the admixture. The admixtures shall conform to ASTM C-494.

g. The concrete mix shall indicate evidence of meeting or exceeding the following criteria unless shown on the drawings.

(1) Minimum Strength: 3000 psi unless otherwise specified on the drawings.

(2) Slump: ASTM C-143, 3-5 inches

(3) Cement: ASTM C-150, Type I or IA
Minimum content; 6 sacks (94 lb. sacks per c.y. of concrete)

(4) Water: Clean potable and free of foreign matter.
Maximum content; 7 gallons per sack of concrete

(5) Aggregates: **Fine aggregate** shall consist of natural sand, manufactured sand, or a combination thereof. Certain manufactured sands produce slippery surfaces and should be investigated for acceptance before use. (ASTM C-33). Fine aggregate, except as provided in Section 4.2 (ASTM C-33) shall be graded within the following limits:

Sieve Designation	Percent Passing
3/8 inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 50	25-60
No. 100	2-10

Coarse aggregate: Concrete mixes shall be size numbers 467, 57, or 67 (ASTM C-33).

(6) Air Entrained: Concrete mixes shall have 5-7% volume of air using an air entrained admixture.

3. INSPECTION AND TESTING

The following is a partial listing of the common American Society for Testing and Materials, ASTM, test requirements for concrete that may be used to verify concrete quality:

a. ASTM C-31, "Making and Curing Concrete Compressive and Flexural Strength Test Specimen in the Field."

b. ASTM C-33, "Concrete Aggregates."

c. ASTM C-39, "Compressive Strength of Cylindrical Concrete Specimens."

d. ASTM C-94, "Ready Mix Concrete."

e. ASTM C-143, "Slump of Portland Cement Concrete."

f. ASTM C-150, "Portland Cement."

g. ASTM C-172, "Sampling Freshly Mixed Concrete."

h. ASTM C-231, "Air Content of Freshly Mixed Concrete by Pressure Method."

i. ASTM C-260, "Air Entraining Admixtures for Concrete."

j. ASTM C-494, "Chemical Admixtures for Concrete."

The NRCS shall have free entry to the plant to review the equipment used for mixing, dispersing, weighing, agitating and delivering concrete. Proper facilities shall be provided for inspecting materials, equipment and processes and to obtain samples of the ingredients and concrete. All tests and inspections will be conducted so as not to interfere unnecessarily with the manufacture and delivery of the concrete.

4. HANDLING AND MEASURING MATERIALS

Materials shall be stored and handled in a manner that will prevent degradation, segregations, contamination or inter-mixing of materials before measurement.

Scales for weighing aggregates and cement shall be beam or springless dial type, clean and operating within 1 percent accuracy for cement and 2 percent accuracy for aggregates.

All materials entering into the concrete shall be mechanically measured by weight except the air entraining admixture and water which may be measured by volume.

5. MIXERS AND MIXING

Concrete shall be furnished by ready-mix methods only.